MASTER OF SCIENCE
IN
PHYSICAL OCEANOGRAPHY

CHANGES IN THE HYDROGRAPHY OF CENTRAL CALIFORNIA WATERS ASSOCIATED WITH THE 1997-1998 EL NIÑO

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During 1998-1997, oceanographic conditions off Central California were monitored by means of a series of thirteen cruises which measured water properties along an oceanographic section perpendicular to the California Coast. Data were analyzed by utilizing time series plots on isobaric and isopycnal surfaces and by principal component analysis. The following conditions were observed: (a) in June-July 1997, the strong poleward flow at the coast was associated with coastal (within 100 km), subsurface (200-500 dbar) warming of 0.5°C and increased salinity (0.07) on isopycnal surfaces and offshore waters appeared cooler, fresher with stronger equatorward flow; (b) in September 1997, a relaxation of El Niño conditions occurred, with coastal, subsurface waters cooling by 0.3°C, and the band of poleward flow at the coast narrowed; (c) in January 1998, maximum interannual temperature and sea level anomalies were observed with nearsurface (80 dbar), nearshore (within 100 km) warming of 2.5°C , subsurface warming comparable to that observed in June-July 1997, and equatorward flow at the coast; and (d) in March-April 1998, coastal waters freshened greatly, both due to the onshore flow of Subarctic water and to river runoff from winter storms. By summer 1998, hydrographic conditions were near normal.

The observed warming in late 1997 was not caused by decreased offshore Ekman transport but does appear to be remotely forced by poleward propagation from the Equatorial Pacific along the Eastern Boundary, possibly by Kelvin waves. The subsequent onshore transport and freshening that took place during Spring 1998 could have been related to onshore Ekman transport associated with winter storms. The observed change in heat content associated with the 1997-1998 El Niño was the same as that observed during a normal seasonal cycle.

DoD KEY TECHNOLOGY AREA: Other (Oceanography)

KEYWORDS: California Current System, El Niño, Eastern Boundary Currents

ANALYSIS OF LOW FREQUENCY TRANSMISSION LOSS IN THE SHALLOW TIMOR SEA

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The objectives of this study were to enhance understanding of the parameters affecting transmission loss in the shallow waters of the Timor Sea and to conduct a performance analysis of the range dependent acoustic PE model, RAM. The study utilized transmission loss data (from 10-1600 Hz) collected by DSTO and NAWC during the SWISS 1 experiment held in the Sahul Shelf area in early March 1994 in waters ranging from 60 to 120 m depth. In addition, transmission loss data from a similar experiment conducted in 1990 in the same area was used as a comparison to the SWISS 1 data.

The analysis revealed that the acoustic environment over the Sahul Shelf exhibits a high degree of lateral variability which is primarily dependent on the geological composition of the shelf region. Of particular interest was the north/south oriented SWISS 1 transmission loss data which displayed characteristics associated with shear wave coupling. RAM was able to accurately simulate the SWISS 1 transmission loss for regions uneffected by shear wave coupling but failed to simulate portions of the north/south track where transmission loss data was excessive. A version of RAM which incorporates shear wave effects, RAMS, was used to simulate the north/south transmission loss data. Due to the high range dependence of the geoacoustic parameters, coupled with inadequate availability of geoacoustic data for this region, only limited success was achieved using RAMS.

DoD KEY TECHNOLOGY AREA: Battlespace Environments

KEYWORDS: Under Sea Warfare, Propagation Loss, Timor Sea, Shear Wave Coupling, Low Frequency Acoustic Transmission